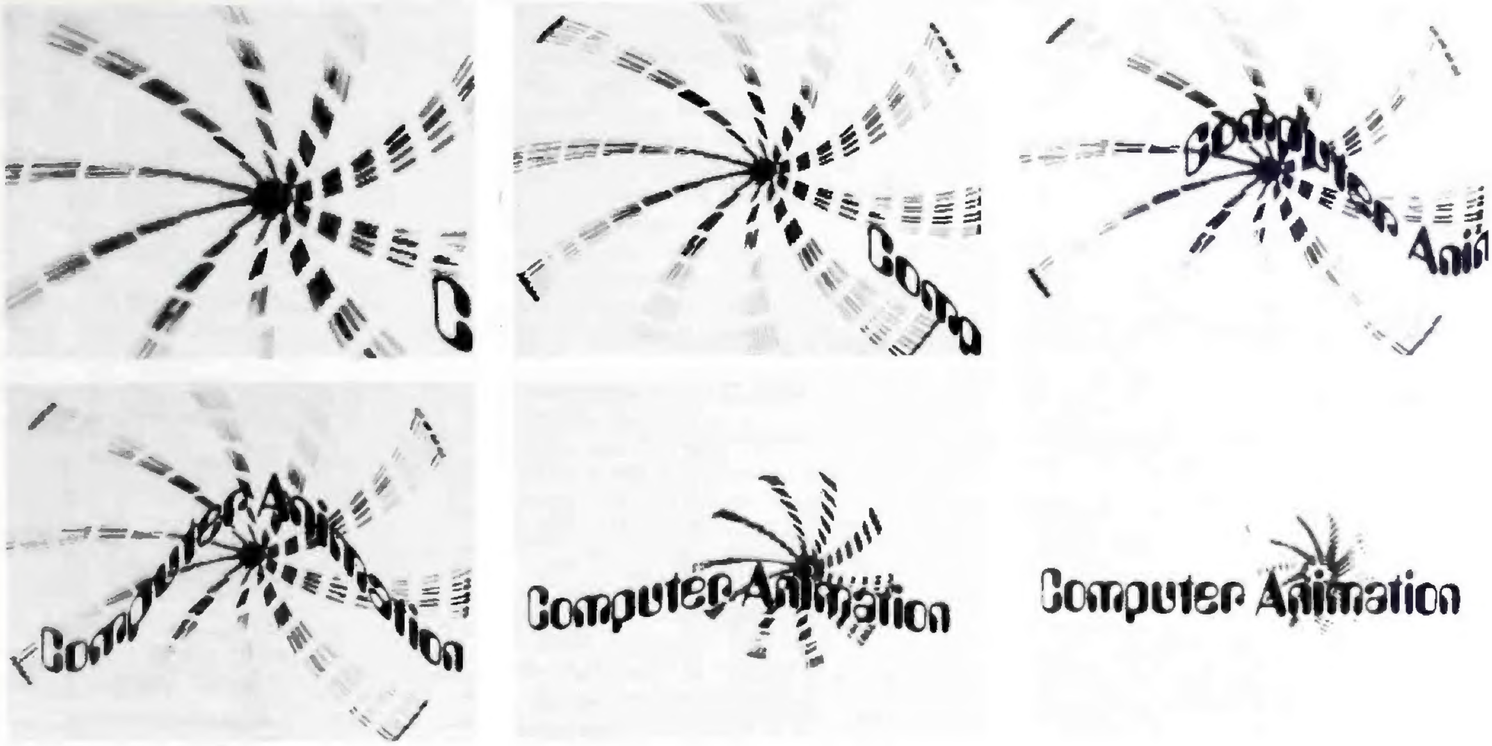

COMPUTER ANIMATION: *TELEVISION PRODUCTION GETS A WHOLE NEW IMAGE*

By Domenic Iaia
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When one thinks about the animation process the image that automatically comes to mind is an assemblyline of artists, inkers, and painters, in fact, a veritable manufacturing process as tedious in its functions as the most complex industrial operation.

But now the computer — long the godhead of many industries — is making its presence felt in the artistic realm as well. The Computer as Animator has taken its place in the video industry as a pioneer in moving graphics and has, quite predictably, achieved enormous savings in time and manpower.

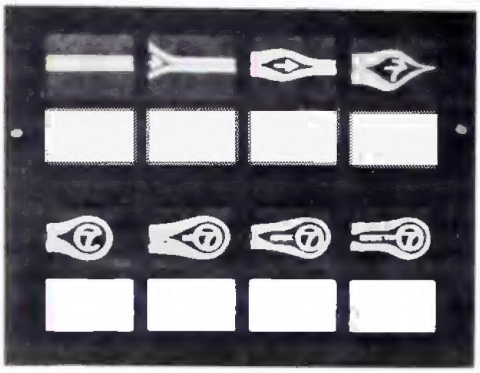
Computer animation is utilized in many instances, noteably in television commercials. You've probably seen some of its more distinguishable effects where letters, or a company logo will jump across the television screen, will scramble, rotate, explode, then all of a sudden rush together to form a word.

One of the first companies to bring electronic applications to animation was Computer Image Corp. with their *Scanimate* animation system. The Scanimate has been a prolific producer of television commercials, TV station I.D.'s, industrial and educational videotape and films. Its production arm, Image West, recently set up headquarters in Los Angeles under its president, Michael Webster. Webster, a veteran in both animation and live action production for 18 years, is responsible for packaging the Scanimate as a creative tool designed for artists. Says Webster: "Anyone with a creative mind can create animated projects with our system. The operator can produce an infinite variety of spectacular effects and put an image through an incredible range of movements by simply manipulating knobs and dials. The system offers versatility and speed, graphic innovation and economy. The important thing for an individual to remember when working with computer animation is that most anything is possible. Through computers graphic effects can be done that were never possible with conventional animation."

Preparation procedures of computer animation parallel those of conventional animation. The agency presents a storyboard for, say, a 30-second commercial and creative ideas are exchanged between the agency representative and the animation artist staff. Design elements are taken from the board and translated into animation technique. Upon approval of the boards, computer production from beginning to finished product can be accomplished typically in one or two days. By contrast, standard animation production time usually varies between six and eight weeks.

The system is actually more difficult to describe than it is to operate, but a very basic understanding of how it functions is to think of what happens when a television set goes on the blink . . . the picture moves, rolls, doubles, flops around, expands, contracts, etc. This is exactly what is happening to images fed into the computer, however its effects are refined, patented, and under precise control of the computer operator.

Russ Maehl (left), and Domenic Iaia (right) sit in front of Image West's Scanimate animation computer system as they prepare to produce an animation sequence.



Action sequences for computer animation, as with conventional animation, are prepared by an artist in the form of a storyboard.

Without getting heavily into computer theory, the Scanimate animation computer is different from the conventional computer systems used by many businesses. Scanimate computers will not figure your rent or payroll . . . they were never designed for that purpose. They were designed as video image controllers. The conventional type of computer that will do accounting and payroll are *digital* computer systems. Digital computers are disadvantageous to use as an image producer, becasue images must be fed, point by point, into the system through mathematical formulas. In other words, to describe an image, the image must be programmed by inputing different vector points within that image. In using normal computer programming input systems, how would one describe something like Mickey Mouse? How do you program the fluidity of line? When an animator must sit for hours with a computer programmer attempting to map out functions, it was felt that this removes the artist from his environment. That was the whole purpose behind Scanimate . . . to take the best of both worlds . . . keeping the artist as the creative functioning device generating visuals, and take the tedium out of producing those visuals in terms of moving forms through a computer animation system.

As opposed to the *digital* computer,

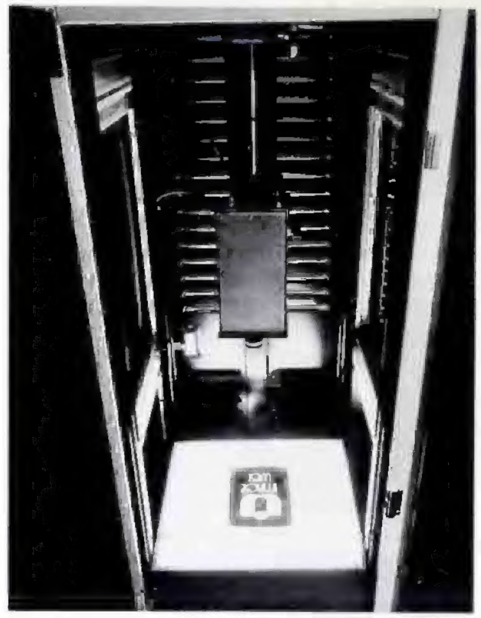
The next step is preparation of black and white artwork on transparent sheets, or "Kodaliths." These are the counterparts, in the Scanimate system, of cels used in conventional animation. There is one very important difference, though: a single Kodalith is the equivalent of dozens, or even hundreds of conventional cels.

Scanimate is an *analog* computer, and its advantages to animation will be discussed, but first let's look at the basic differences between *analog* and *digital* computers. Analog computers were among the first computers to be made. Stemming from the abacus, electronic analog computers were deemed as being too unsteady for ultra-precision work involving vast amounts of information. As a result, a much more precise approach was brought about through *digital* computers. The digital computer involves a binary, *yes* or *no* approach. There is no *maybe* in its computing functions. In an analog system, levels can be set where decision changes are desired. It can be decided how much of the computing function is going to be *yes* and how much will be decided as *no*. Such decision levels are set on the Scanimate through the manipulation of knobs and patching. How does this relate to animation? The digital system had to be programmed to build shapes. Mathematical functions were entered through keypunch to describe an image, but that gets very difficult when you're animating an artist's drawing where he has perhaps used a drybrush technique where the edges of the image trail off and are not completely defined. With the Scanimate analog system, that problem has been obviated by not having to re-map out the images in mathematical formulas. How? Scanimate actually *views* the original artwork . . . through a television camera, the artwork is scanned and converted into electronic signals that the computer uses as input.

With the variable analog computing functions, the artwork is interpreted precisely as the camera sees it. Television cameras used with digital systems will recreate artwork in a very *hard* form, but the analog computer will precisely turn out even the most intricate of artwork.

A CLOSER LOOK AT THE SYSTEM:

The computer animates images in the form of light. It is actually only animating light, and artwork is being used to trap that light and give it form. Into the computer is generated a square of light . . . an imaging area . . . called a *raster*. This is simply achieved by taking artwork (perhaps a word, company logo, photograph, etc.) in the form of a transparency or negative and placing it on top of a piece of back-lighted opaque glass. This square piece of glass is what generates the *raster* area, and the negatives placed on top of the glass trap and form that light into shapes (again, words, logos, photographs). Mounted directly above and scanning down on the artwork is a black and white high resolution raster vidicon television camera. Television pictures are of course composed of a multitude of horizontal lines . . . the normal American television picture being derived from 525 lines. This high resolution camera produces a highly condensed picture made up of 945 lines

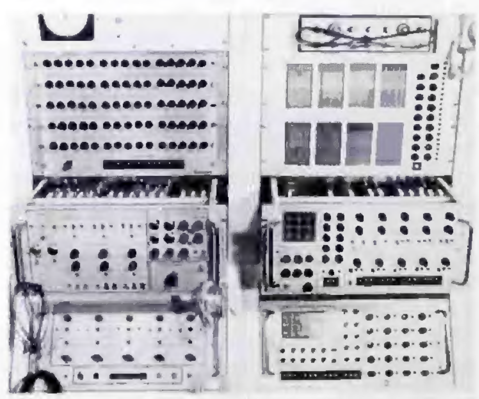


The Kodalith is placed in front of a high resolution vidicon TV camera, which transmits the image into the animation controlling stage, and to a monitor for viewing.

. . . nearly twice the density of the normal television set. This density is used to give the input images better focus and precise detail transformation.

This high resolution television image is then fed into the computer and manipulated by the computer operator. He actually has complete control over the effects on the image . . . the same types of effects that we said take place when your television set goes haywire. Simply by patching and turning dials, the operator can take that image and move it, expand it, contract it, alter its horizontal, vertical, and depth position, horizontal and vertical size, rotate it, explode or scramble it, change its intensity, shape, etc. etc. etc.

What the computer is doing is controlling the scan lines of the image and determining where they are to be drawn. Since the image raster is made up of 945 lines, the computer actually decides where each of the lines will be placed. The knobs and dials that are turned are affecting the voltages that are going to be applied to the systems deflection amplifier (the deflec-



The operator watches the image on the screen as he activates it by manipulating appropriate controls on the animation control console, pictured above.

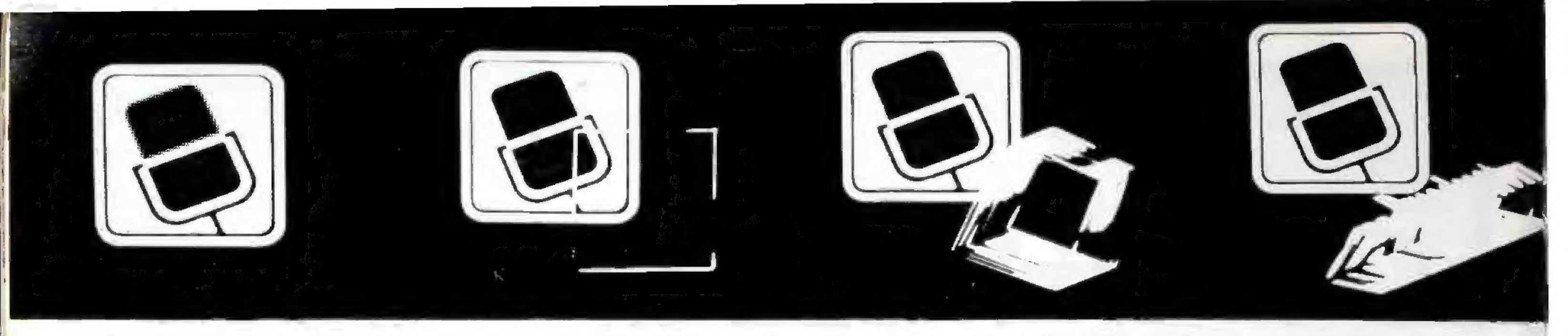
tion amplifier is the unit which controls the scan of the electron beam on the monitor cathode ray tube). Other knobs initiate the operation of filters to change the nature of the input video signal.

In programming the sequence of an image's animation, the computer's *initial/final* switch in put in the *initial* position. Then through pre-planning, and sessions of experimenting, the signal is patched through the network of knobs, timers, filters . . . these patch cords and the patching network actually making up the computer's memory. An analog system is really a system of voltage controls and voltage packages. The operator is building up a whole package of voltages that are going to control each section . . . its movement, size, time, etc. These voltage packages are all electronically stored within the computer's memory. After the animation procedure is programmed, the flipping of the *initial/final* switch into the *final* position will initiate the program and cause the image to go through the animation sequence. The product of the alteration and manipulation of the image is displayed on a small black and white (actually green and white functioning as black and white) high resolution 945 line X–Y monitor. More about this monitor later.

The animated images appear on a small, round high resolution TV screen, and is then scanned by a black and white plumbicon 525 line camera which feeds the image into the colorizer. The above "scan conversion system" converts the high resolution 945 line image into a normal, usable 525 line TV picture.

Computer animation is approached in a similar manner as conventional animation . . . on a film animation stand you will shoot one scene at a time. Scanimate animation is produced one segment at a time, but if the animation gets very complex, two Scanimates can be operated in tandem; one providing one set of information, overlayed with more information from another computer. The two sequences can be *mixed* together, recorded on video tape and dubbed in as background to more animation on top of it.

The computer is very flexible and can accommodate very complex animation sequences. As a matter of fact, the system can differently animate up to five separate image sections all at once, and mix them together on the final monitor screen as one animation sequence. To give an example, if you had three letters (you can



The above frames, when viewed from left to right, show a Scanimate animated sequence using a variation of the BP&P logo as the subject.

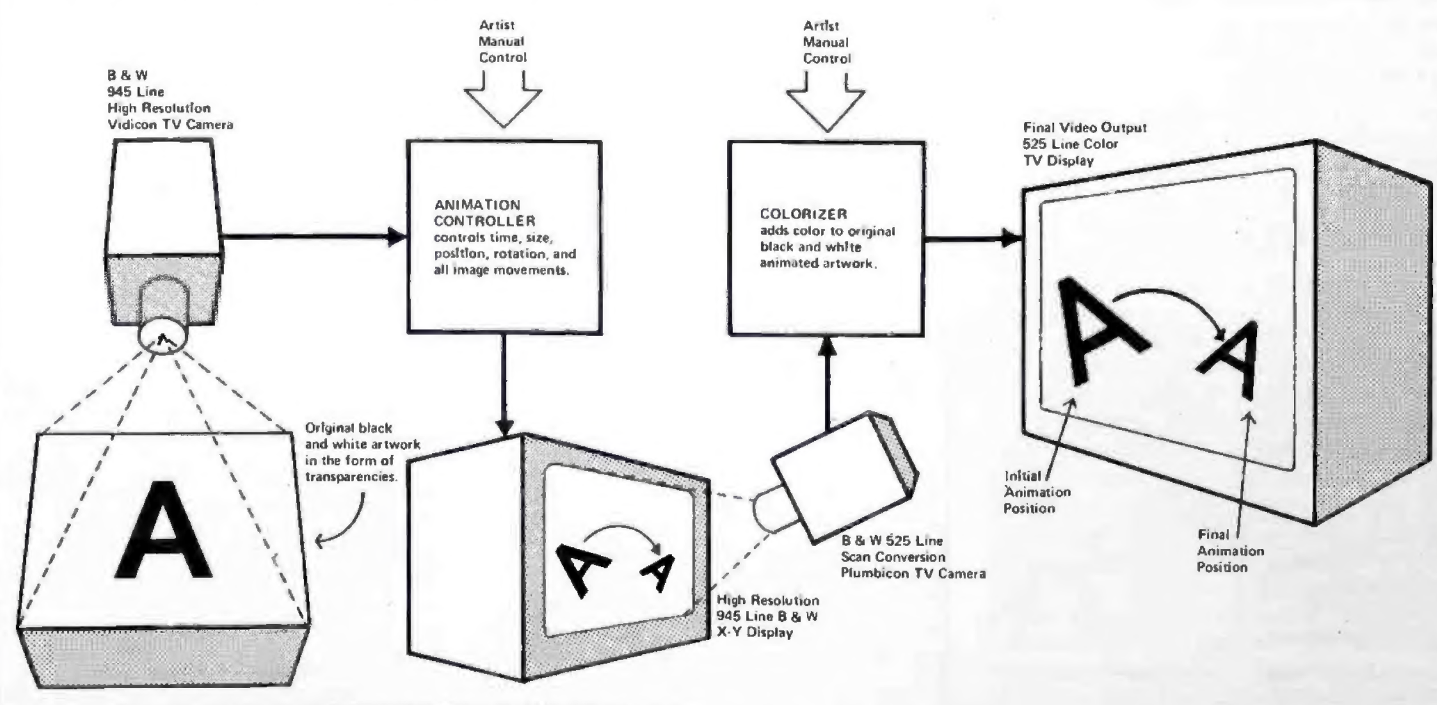
have up to five at once) programmed into the system, and you wanted to individually and differently animate those letters, say the first letter will scramble, the second one will jump across the screen, and the third will rotate, then after a few seconds the letters will all come together and line up spelling a word, this can be done according to the following. The original raster, made up of 945 lines, can be broken up into as many as 5 separate raster areas of arbitrary size. This can be done by using *line counters* in the system. The three letters in transparency or negative form will be stacked on top of each other and placed beneath the vidicon camera (see Fig. 2). The line counters will then count the number of horizontal lines that make up the image area and tell the computer where one area begins and the next ends. The number of lines that make up each individual image area is determined and set by the operator. For example, in the letters *A*, *B*, and *C*, in Fig. 2, the operator might decide he wants the letter *A* to take up the first 245 horizontal scan lines in the raster area, the letter *B* the next 260 scan lines, and *C* the remaining 440 scan lines of the original 945 line raster area. The computer remembers the dividing points between the three letters, and the operator can program and manipulate each of the divided raster areas into totally separate animation sequences. Since the computer is animating bars of light in the form of letters, all of the divided sections can be played back together, and even cross over each other on the final monitor screen. The images are not limited to the action area on the screen . . . they can be taken off the side of the screen, brought back on, zoomed up from a point in the center of the screen, reduced to a point, rotated, separately or together, in any combination.

The black and white image is fed into the above "Colorizer" where color is added after the animation is completed. The final animated image is displayed on a monitor, in full color.

COLORIZATION

Thus far we have discussed the first section of the Scanimate . . . the section that manipulates the input black and white artwork into altered and animated forms. The next step is to take these black and white animated forms and add color to them. Previously we brought up the little black and white high resolution X–Y monitor (actually green and white) that displays the animated forms. This small monitor screen is scanned by another television camera . . . this time a black and white plumbicon NTSC camera . . . scanning at a raster of 525 lines (normal number of lines on typical American television sets). The purpose of this camera is to convert the 945 line high resolution image to the normal 525 line image so that it can be used with normal television equipment, and to input the black and white signal into the *colorizer* to add color to the image. This second camera, the *scan convertor camera* can look at the gray intensity differences in the

FIG 1. BLOCK DIAGRAM OF SCANIMATE ANIMATION COMPUTER



In the above animation sequence, the letter "A" will rotate clockwise from the left hand side of the screen to the right hand side as it gradually reduces in size.

images. For instance, a black and white photograph will consist of black, white, and several different intensities of gray. The Scanimate can take those different levels of gray and assign any color to each intensity. To further explain, the system can detect and assign colors to up to five different gray intensity levels. The split up signal is sent to five sets of color pots . . . each set of red, green, and blue (the primary colors for television). For each of the specific gray intensity level variations, by using various color pot combinations, the operator can create any color or assortment of colors and intensities in the visible spectrum. You can make the black areas in the original photograph any color you want, the dark gray areas any color you want, as well as with the medium grays, light grays, and white areas. That certainly provides for some interesting effects. An example is the cover of this issue you're reading . . . originally taken from a black and white photograph.

What makes the system even more flexible is the fact that the colorizer has an internal process by which you can introduce a background. In other words, you can take one of the intensity levels, and instead of assigning a color to that level, mix in another signal perhaps from an outside video tape source as a background. This means you can have full color animation over live action, additional animation, or some other background. The finished product of the entire animation process is displayed on a 525 line color television monitor, and from that the animation sequences can be videotaped or photographed for its end use.

When different images are divided into the up to five separate rasters previously discussed, an interesting and useful effect takes place if the separate images are assigned colors and pass over each other on the final monitor screen. Since you're working with light, the colors won't mix. What will happen is that the light intensities will build up where the images cross paths, and in those areas will create the color assigned to the next highest intensity level. To illustrate this, say you have fed in a black and white photograph, and you have designated the black areas on the photograph to reproduce as blue, the gray areas of the photograph to reproduce as yellow, and the white areas of the original photograph to reproduce as red. If the photograph was scrambled or re-arranged in such a way that some of the blue and yellow portions passed over each other, the end color result in the combined areas would not be green (as if you mixed paint). The resultant color in those areas would be red, because the light has been built up to a higher intensity, and the computer picks it up as simply being the next highest intensity of light. The computer then assigns the next highest designated color, red, to those areas. Once this function of the computer is understood and grasped, it can be used to create spectacular color effects as images cross over one and other.

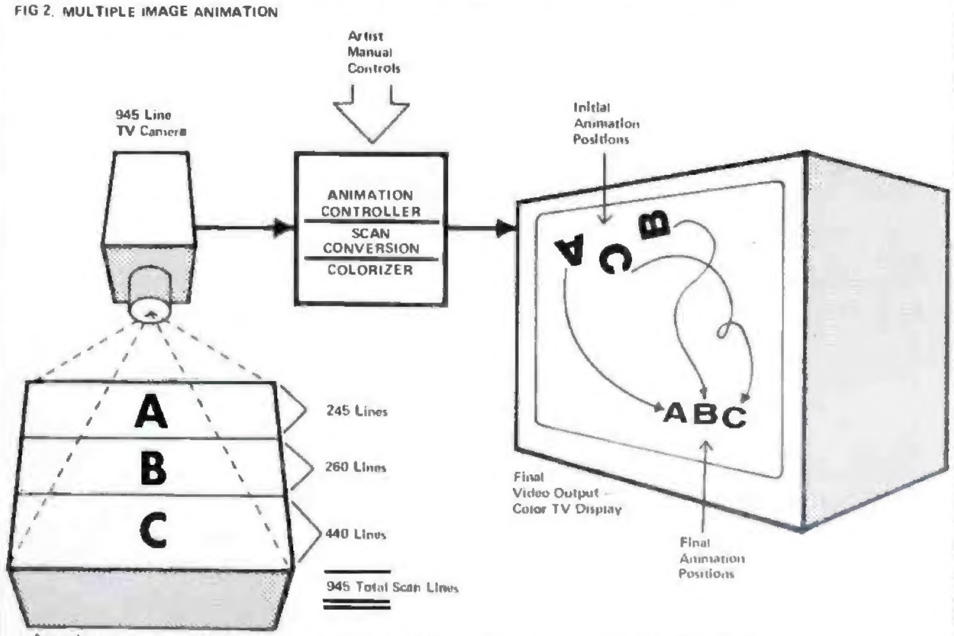
The final animated product is recorded on video tape in the video production room. The product may then be edited and pieced together, or used as background for more animation on top of it.

LIMITATIONS OF THE SYSTEM

Scanimate is limited in that it cannot produce conventional character animation. It does not do this because there is not a sufficient memory in the system to hold all the elements together over complex rotation and size change maneuvers. In addition, there is no internal matting system which allows the holding of particular sections in terms of their colors. When moving one solid area over another, for example, a cartoon character's arm of one color moving over his body of another color . . . light intensities will be built up causing the colors to change in the crossing areas. A new, more complex computer system called "CAESAR" (Computer Animated Episodes through Signal Access Rotation) designed by Computer Image Corporation in Denver, Colorado, is capable of producing conventional character animation.

In taking two-dimensional planar artwork, abstracting that image into geometric or non-geometric forms, rotating it, scrambling it, expanding, contracting, moving, adding color to it . . . all of the Scanimate's operations . . . can be integrated into something which is much more than a gimmick. The Scanimate is a useful, resource saving tool for putting objects in motion for television and motion picture animation production.

FIG 2. MULTIPLE IMAGE ANIMATION



In this sequence, the letters "A", "B", and "C" are divided into separate rasters through the system's line counters. The three letters start out in the upper left hand corner of the imaging area with jumbled positioning. As the animation sequence begins, the letters are moving in individually controlled paths across the screen, rotating to an orderly position at the bottom right hand corner of the screen.